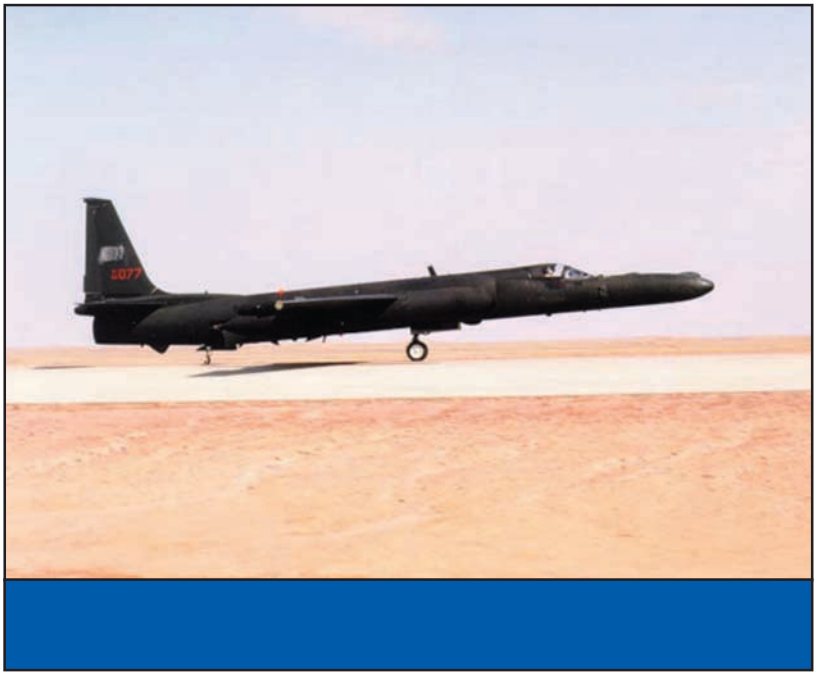
Air Force Research Laboratory | AFRL

Science and Technology for Tomorrow's Aerospace Forces

Success Story

VERSATILE TRANSPARENCY MATERIAL OFFERS SUPERIOR PROTECTION WHILE SAVING MILLIONS OF DOLLARS



Polycrystalline aluminum oxynitride, or ALON™, satisfies a diverse range of technological interests throughout the Department of Defense (DoD) and other federal agencies due to its extensive versatility. It offers performance and scaling not otherwise possible for large, strong, lightweight, infrared (IR) transparencies and transparent armor applications that are affordable. Military applications include forward-looking IR windows and domes, such as missile domes and towed underwater sensors, and transparent armor including windows for motor vehicles, riot shields, and protective headgear for bomb disposal operations. Commercial uses for ALON™ include supermarket scanner windows, currently being field tested, watch crystals, and scratchproof lenses.

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Accomplishment

Research engineers at the Materials and Manufacturing Directorate, working with Raytheon Electronic Systems, identified a tough, lightweight, transparent material that could substantially reduce the cost of windows on military reconnaissance aircraft. Directorate engineers are scaling this new material, ALON™, into 20 in. long by 14 in. wide blanks to evaluate forming techniques and optimize fabrication processes, in order to produce a window for flight testing. The successful development and transition of ALON™ could reduce the life-cycle cost of reconnaissance aircraft windows by as much as $25 million, while providing greater protection for flight and ground vehicle crews.

Background

ALON™ is an extremely tough, lightweight, transparent ceramic material offering outstanding potential for both military and commercial applications. ALON™ offers significant advantages over conventional materials currently used to make windows for reconnaissance aircraft, missile domes, protection shields and lenses, and other important products.

ALON™ is a very durable, optical material with a high degree of transparency from the ultraviolet through the mid-IR wavelengths. A potential market exists for its use in commercial supermarket scanners, which are manufactured in quantities of tens of thousands of units per year. ALON™ is equivalent to sapphire in terms of optical quality, low density, high strength, and high durability, however, ALON™ is an isotropic ceramic, making it scaleable by conventional powder processing methods.

ALON™ demonstrates outstanding ballistic impact resistance, making it an excellent candidate for motor vehicle windows designed to safeguard occupants. The new material is IR transparent, whereas glass, polycarbonate, and other conventional materials are not. Directorate engineers identified tens of thousands of window panels throughout the DoD as potential applications for ALON™ technology.

Materials and Manufacturing
Emerging Technologies

Additional information

To receive more information about this or other activities in the Air Force Research Laboratory, contact TECH CONNECT, AFRL/XPTT, (800) 203-6451 and you will be directed to the appropriate laboratory expert. (01-ML-06)